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ABSTRACT

The purpose of this research was to assess the validity of recent claims that experimenter-provided pictures facilitate young children's oral prose learning. The major question of interest was whether the pictures do nothing more than prompt the child to process the just presented information one more time, Three experiments were designed to test this problem. The data revealed that although first-grade children do indeed benefit from either self- or experimenter-supplied repetitions of text (relative to no repetitions), the facilitation is not as great as that associated with pictures. (Author/MKM)

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Pictures, Repetition, and Young Children's Oral Prose Learning

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Running Head: Pictures and Children's Prose Learning

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Abstract

The purpose of this research was to assess the validity of recent claims that experimenter-provided pictures facilitate young children's oral prose learning. The major question of interest was whether the pictures do nothing more than prompt the child to process the just-presented information one more time. The data revealed that although first-grade children do indeed benefit from either self- or experimenter-supplied repetitions of text (relative to no repetitions), the facilitation is not as great as that associated with pictures. It is recommended that subsequent research in this and related contexts: (i) employ repetition controls in addition to, or instead of, nonrepetition controls; and (ii) continue to search for the functional components of facilitative stimulus materials and/or processing strategies.

A question of contemporary interest to educational researchers--and one of potential practical significance to educators--is whether pictures can be used as adjuncts to facilitate children's learning. Although the answer to this question has been overwhelmingly affirmative in laboratory tasks designed by psychologists to measure children's simple associative learning and recall (cf. Levin, in press; Reese, 1970), evidence pertaining to the efficacy of pictures has been less convincing when it comes to assessing children's performance on more school-like tasks (see, for example, Samuels, 1970). Indeed, Samuels has argued that pictures may in fact be detrimental for young children learning to read to the extent that the pictures divert the child's attention away from the critical features of the to-be-discriminated letters (e.g., see Willows, Note 1; but also Lippman & Shanahan, 1973).

The present study is not concerned with learning to read. In fact, it is technically not even concerned with reading. It is concerned, however, with children's processing of information that could be acquired through reading, namely with the comprehension of narrative passages similar to those that appear in children's textbooks and story books. Specifically, the children in these experiments are read some stories, each of which is followed by a series of "Wh" questions. The addition of pictures to the stories is believed to inform us as to the amount of facilitation (or lack thereof) that can be attributed to the pictures.

But does it? A number of very recent investigations have all detected an increment in young children's performance when pictures were added to orally-presented stories of the kind just described (Lesgold & DeGood, Note 2; Lesgold, Levin, Shimron, & Guttmann, 1975; Peeck, 1974; Rohwer & Harris, 1975; Guttmann, Note 3; Shimron, Note 4). That is to say, in each of these studies it was found that children (typically, pre-readers just entering school) recalled substantially more about a passage when the passage was accompanied by pictures than when it was presented alone. However, each of these studies suffers from a design problem that may render any conclusion about picture efficacy doubtful. Lauren Resnick (personal communication, June 1975) has pointed out, in particular reference to the Lesgold et al. (1975) study, that a picture capturing the contents of just-presented verbal information may be nothing more than an inducement to the child to rehearse that information one more time. If so, the picture-versus-nothing design does not tell us whether a picture is better than some other reminder to keep thinking about the material just heard. The claim that pictures merely prompt a second rehearsal of the previously-presented information will be referred to as the "simple rehearsal hypothesis."

Quite frankly, we were quick to dismiss this speculation in our earlier study, on the basis of numerous data in the verbal-learning literature concerning the relative impotency of simple repetitive rehearsal as it affects subjects' recall--

especially when the repetitions are massed, as in the present context. However, the bulk of the research we considered was based on adult subjects recalling lists of words. Our materials, on the other hand, consisted of meaningful (and presumably, interesting) stories, and children (our subjects) are known to do the strangest things. We thought it best to assess the simple rehearsal hypothesis empirically and directly, rather than through generalizations from adult findings. Accordingly, we tested children in a picture/prose context. It should be noted at the outset that the findings we report are at the same time discouraging, encouraging, and of tremendous importance to those contemplating the conduct of research in this area (and, for that matter, in related areas as well).

Experiment 1

Before proceeding to our major question concerning pictures-as-a-second rehearsal per se, we wished to probe certain other aspects of the Lesgold et al. (1975) data. In that study consisting of several experiments, first graders listened to stories while being provided with picture cutouts that could be placed on an appropriate background. In the "control" condition for that study, subjects were provided with simple geometric forms to color, rather than story-relevant pictures to select, place, and/or observe. Although this can be construed as an appropriate control in a strict "filler activity" sense, it is possible that it is inappropriate in another sense. Specifically, coloring in story-

irrelevant forms may have interfered somewhat with the children's processing of the stories, relative to a situation in which no irrelevant filler activity is required. Indeed, there is some recent support for this speculation in the prose learning of adult subjects (e.g., Curtis, Note 5). Thus, the Lesgold et al. (1975) Activity Control and a new Nonactivity Control were compared here. In addition, by including a Repetition condition, in which subjects repeated each sentence aloud as it was presented, we were also able to determine whether simple repetition and irrelevant interpolated activity respectively increased and depressed performance relative merely to listening to the stories.

Method

Subjects. Forty-eight first-grade children were selected from two semirural communities in the midwest, and assigned in equal numbers to the three experimental conditions. The experiment was conducted in the middle of the school year.

Design and Materials. Three single-episode stories of 30 to 75 words taken from Lesgold et al. (1975) were used. The stories were constructed to be easily understandable and interesting to first graders. Each story was recorded on tape by a male speaker. Three different presentation orders of the stories were utilized, with each story appearing in each temporal position once. Of the 16 subjects in each condition, 6 were randomly assigned one presentation order, and 5 were randomly assigned each of the other two.

In the No Activity Control condition, all three stories were played to the subject uninterrupted. In the Activity Control condition, after each sentence was played the tape was stopped and the subject was required to color in a geometric form with a felt-tip pen (as in the Lesgold et al., 1975, study). Finally, in the Repetition condition, after each sentence was played the tape was stopped and the subject was required to repeat the sentence. Precise repetition was not necessary, but if the subject was unable to repeat even the gist of the sentence, the experimenter gave a verbal prompt, consisting of one or more of the sentence's words. (In the actual experiment, prompting was required very infrequently.)

Procedure. Subjects were tested individually. The child was instructed that he/she would be listening to some stories and that later he/she would be asked some questions about them. A sample one-sentence story and question was then provided for the subject as practice. Following this, the subject listened to the three stories (each preceded by an appropriate title) and, if required, performed the accompanying task for his/her condition. After all three stories were presented, the subject was given the title of each story in order, and asked to retell the story without regard to its exact wording (free recall). After recalling a given story, the child was asked five short-answer "Wh" questions, one about each sentence of the story (cued recall). Both free and cued recall proceeded at the

child's own pace.

Results and Discussion

Originally it was intended that both free- and cued-recall measures would be analyzed. However, as a result of the large number of free-recall protocols that were either unscorable or virtually empty, the free-recall data were abandoned. In retrospect, free recall of stories may not be a terribly valid measure of learning for children of this age inasmuch as a number of children who recalled almost nothing about a story when asked to do so were able to answer virtually every question about it correctly. It is possible that young children's performance on the free-recall measure is as much a function of personality (e.g., shyness, extraversion) as it is a function of memory or ability. It is also reasonable to suppose that young children are less proficient in the retrieval skills associated with a free-recall instruction. In any event, the free-recall data suffer from a substantial floor effect in all of our experiments and consequently, the analyses conducted throughout will be based exclusively on subjects' cued-recall performance.

The mean percentages of questions correctly answered were 59%, 52.5%, and 78% by subjects in the No Activity Control, Activity Control, and Repetition conditions respectively. The hypotheses concerning facilitation due to repetition and interference due to irrelevant activity were evaluated by Dunnett's test ($\alpha = .05$, one-tailed). According to this procedure, it

was found that repetition was indeed facilitative: Repetition vs. No Activity Control, t (45) = 2.86. On the other hand, irrelevant activity was not interfering: Activity Control vs. Nonactivity Control, $|t| < 1$.

Thus, the present findings appear to have resolved two preliminary pieces of the puzzle: Simple repetition does facilitate children's cued story recall, relative to no repetition; but irrelevant interpolated activity does not interfere with it. Both of these conclusions are in marked contrast to those derived from the available verbal-learning and prose-learning literature based on older subjects, where: (i) irrelevant interpolated activity has been found to interfere with subjects' normal uninterrupted processing of prose (Curtis, Note 5); and (ii) simple massed repetition has had little positive effect (and in some cases has even been harmful--see, for example, Levin, Ghatala, Guttmann, Subkoviak, McCabe, & Bender, Note 6, Experiment 1).

Experiment 2

That repetition facilitated performance on the present task is compatible with the simple rehearsal hypothesis concerning the possible contribution of pictures. However, in order for the hypothesis to be a sufficient one, it must be demonstrated that the amount of facilitation associated with repetition is as great as that associated with pictures. Experiments 2 and 3 were conducted to make the necessary comparison.

In this experiment, the Nonactivity Control and Repetition conditions of Experiment 1 were compared with an experimenter-provided picture condition (Lesgold et al., 1975, Experiments 2b and 3). In fact, in order to examine possible differences due to variations in types of provided pictures, two different picture conditions were employed. One was the Lesgold et al. Cumulating Picture condition in which appropriate cutouts were placed on a background after each sentence was played and remained there for the duration of the story. It is worth noting that: (a) this condition eventually afforded an integrated picture of the entire story; but at the same time (b) according to a more complex rehearsal notion (the "cumulative rehearsal hypothesis"), it could be construed as affording a number of rehearsals of the constituent sentences (with earliest sentences likely to be rehearsed the most). Consequently, an alternative picture condition, Noncumulating Picture, was included in which the appropriate cutouts were placed on the background after each sentence, but then removed before the next sentence was presented. If the cumulative rehearsal hypothesis is correct, clearly the Cumulating Picture condition should be more facilitative than the Noncumulating Picture condition.

Method

Subjects. Sixty-one first graders from two semirural schools in the midwest participated in the experiment, which was conducted in the latter part of the school year. Initially, 15 subjects

were randomly assigned to each of three conditions, and 16 to a fourth. However, a tape recorder failure resulted in 14, 15, 15, and 16 subjects in the four conditions described below.

Design and Materials. The passages were identical to those used in Experiment 1. Two of the conditions (Nonactivity Control and Repetition) were the same as in Experiment 1, and two (Cumulating Picture and Noncumulating Picture) were different. In the two picture conditions, for each story an 11" x 17" colored background scene and a set of colored cutout pictures were placed in view of the subject. The pictures were prepared such that every sentence of the story could be illustrated by placement of one or a few cutouts on the background.

In the Cumulating Picture condition, the experimenter placed the appropriate cutouts on the background after each sentence was played, allowing all cutouts to accumulate in the picture. In the Noncumulating Picture condition, the experimenter placed the appropriate cutouts on the background after each sentence was played, and then removed them from sight before the next sentence was played.

Procedure. The same procedure was followed as in Experiment 1.

Results and Discussion

Since the validity of the free-recall data was open to question (see Experiment 1), only the cued-recall results are reported here. In order to maintain comparable statistical power across the three experiments conducted, equivalent analyses

based on about the same numbers of subjects were performed. To accomplish this in Experiment 2 required two separate analysis strategies. The first, directed toward the initiating "simple rehearsal" hypothesis, was based on the same rationale as in Experiment 1. Dunnett one-tailed ($\alpha = .05$) comparisons were performed to determine, on the one hand, whether the facilitation due to repetition (relative to control) could be replicated, and, on the other, whether additional facilitation due to cumulating pictures (relative to repetition) occurred.

According to this analysis, Repetition subjects (mean of 85% correct) outperformed the No Activity Control subjects (61%), $\underline{t}$ (42) = 4.38. (Note that these figures are quite comparable to those of Experiment 1.) It was also found that performance in the Repetition condition was virtually identical to that in the Cumulating Picture condition (86%), $|\underline{t}| < 1$.

The second analysis, focusing on just the two picture conditions, was performed to evaluate the cumulative rehearsal hypothesis. No support for this hypothesis was obtained however, in that performance in the Noncumulating Picture condition (84%) was statistically equivalent to that in the Cumulating Picture condition, $|\underline{t}| < 1$. Further, when the questions were broken down according to position of the information within each story (first part vs. last part, within each story), no conditions-related effects emerged. Although a recency effect was noted, such that questions relating to the last two sentences within

each story tended to be answered better than those relating to the first two sentences, t (29) = 3.95, $p < .001$, performance was comparable in the two conditions on both the first two and on the last two types of questions, $|t| < 1$ in both cases. It will be recalled that according to the cumulative rehearsal hypothesis, a Cumulating-Noncumulating Picture difference on questions related to the information presented earliest in the story would have been anticipated.

To be sure, the lack of difference between the Cumulating Picture condition and the Repetition condition is compatible with the simple rehearsal hypothesis. Before accepting this, however, it should be noted that the extremely high performance level in all but the Control condition (around 85%) may be indicative of a ceiling effect serving to obliterate differences that may have otherwise been obtained. Further evidence in support of a possible ceiling effect is given by the reduced variance in these same conditions (an average of 1.3) in comparison to that in the Control condition (4.0). Because of this possibility, a third experiment was conducted with longer, more difficult passages.

Experiment 3

As just noted, the major purpose of Experiment 3 was to re-evaluate the simple rehearsal hypothesis with materials less likely to produce a ceiling effect. The two ten-sentence passages used by Guttmann (Note 3) were selected, since they proved to be

adequate with his first graders--and even with his third graders. The no activity control and repetition conditions of Experiment 2 were retained in their same form. However, the Guttmann passages did not have accompanying background and cutout pictures. Rather, they had accompanying colored line drawings which captured the contents of each story's sentences, one drawing per sentence. This seemed to us a reasonable stimulus materials generalization to make, and so the Guttmann materials were adopted without reservation.

In addition to the three conditions included for the main analysis, a fourth condition was included for a second analysis as was done in Experiment 2. Through pilot testing it was found that the more complex sentences used in this experiment were not always correctly repeated by Repetition subjects. Although the simple rehearsal hypothesis focuses on the prompting of a rehearsal rather than on the content of the rehearsal itself, it is nonetheless worth determining whether an accurate repetition is as valuable as a picture. Thus, a Provided Repetition condition, consisting of the subject simply listening to each sentence played twice in succession, was included.

Subjects. Sixty-four first-grade children from a midwestern university community participated, with subjects randomly assigned in equal numbers to the four experimental conditions. The experiment was conducted at the beginning of the school year.

Design and Materials. Two single-episode stories that were

used by Guttmann (Note 3) were selected. Each story, which was recorded by a male speaker, consisted of a title and 10 sentences. The order of story presentation was counterbalanced across subjects. As in the previous experiments, a single-sentence story preceded the two stories as an example. For the Picture condition, a 5" x 7" colored picture accompanied each sentence and depicted the events described in the sentence.

The four conditions were as follows: Nonactivity Control and Repetition, as in the two previous experiments; Picture, where an appropriate picture accompanied each sentence of the story as it was played; and Provided Repetition, where each sentence of the story was played two times consecutively (by means of two tape recorders) before proceeding to the next sentence.

Procedure. Essentially the same procedure was followed as in the previous experiments. In this case, however, each subject's cued recall was based on 10 questions (rather than 5) for each story.

Results and Discussion

As in Experiments 1 and 2, and for reasons given earlier, we report only the cued-recall results. Following the previous rationale, a Dunnett analysis ($\alpha = .05$, one-tailed) based on the Nonactivity Control, Repetition, and Picture conditions was conducted to assess the major hypothesis of the study. According to this analysis, there was another replication of the Repetition

condition's superiority (a mean of 66%) over the Nonactivity Control condition (54.5%), t (45) = 2.22. At the same time, however, there is evidence against the claim that rehearsal is sufficient to account for the picture effect, in that the mean of the Picture condition (78%) was significantly higher than that of the Repetition condition, t (45) = 2.16.

Allowing that repetition errors could occur (and, in fact, did occur as discussed below), we compared the performance of subjects in the Provided Repetition condition (69%) with that in the Picture condition and found the former to be significantly lower, t (30) = 2.23, $p < .05$. Thus, based either on the subject's own generation of a (sometimes inaccurate) repetition or on the experimenter's provision of a (consistently accurate) repetition for the subject, the present data argue strongly against a simple rehearsal process underlying the picture facilitation phenomenon. More will be said about this in the following section.

General Discussion

A number of recent studies claim to have provided evidence that young children's oral prose learning has been facilitated by the addition of pictures. Our purpose in conducting the present research was to determine whether or not these claims can be believed. In particular, we wanted to find out whether there was any truth to the alternative speculation that pictures serve to prompt a second rehearsal of the to-be-learned material.

The results of our research suggest that there may be some

degree of truth to this speculation, and that it should not be taken too lightly in the future. In three experiments we found that simply having the child repeat each sentence aloud as it was presented improved performance. An important lesson to be learned here is that blanket generalizations about phenomena associated with older subjects and/or slightly different tasks (cf. Levin et al., Note 6) are not always warranted. Rote repetition of a passage's sentences was not interfering or even neutral for our young children; it was beneficial for them.[1] At the same time, the positive effects associated with rote repetition were observed following an immediate test containing simple verbatim short-answer questions. It would be well worth determining whether the effect holds up--and, for that matter, whether the picture effect holds up--following a delayed test and/or with paraphrase questions (cf. Anderson, 1972).

Although it is possible that pictures induce some degree of rote rehearsal, a simple repetition explanation is not sufficient to account for the picture effect. In Experiment 3, a clear advantage of pictures over simple repetition was noted, an advantage that was maintained even when the repetition was provided by the experimenter in order to eliminate inaccurate statements on the subject's part. The functional components of the picture effect, then, include more than merely an increased quantity of what would also happen in a purely verbal context. In making this statement, however, we are not pretending to

dismiss other potentially beneficial forms of meaningful verbal processing, namely those requiring transformations of the input through such techniques as paraphrasing, inferring, and question-answering. Indeed, it might be useful to compare the consequences of such verbal processing strategies with those associated with pictures under the conditions specified in the preceding paragraph (i.e., long-term recall and/or with nonverbatim questions).

Two other findings deserve mention. First, in Experiment 2 it was found that cumulating and noncumulating pictures were comparably effective. Although this conclusion was based on both a global and a more refined analysis (viz., an examination of temporal effects), it cannot really be taken too seriously at present, in light of the likely ceiling effect alluded to in that experiment. In particular, there it was found that neither picture condition was better than the repetition condition. Clearly, a longer passage (such as that used in Experiment 3) is called for if the cumulative rehearsal hypothesis is to be more validly tested. At the same time, one must realize that an obtained advantage in favor of the cumulating picture condition would not be sufficient evidence to support the hypothesis in that a potentially important "story integration" factor is also associated with this condition. Providing a single integrated picture after the completion of the story might be helpful in teasing apart the various components involved.

Secondly, an as yet unreported analysis of the performance

of Repetition subjects in Experiment 3 turned up an intuitively pleasing result. In this analysis, we found that when subjects gave either a complete verbatim repetition of a sentence or an accurate paraphrase of it, they tended to answer correctly the question relating to that sentence much more frequently (about 86% of the time) than when they gave only a partial repetition, an inaccurate paraphrase, or nothing (52%). This result has a precise analog in the data of Lesgold and DeGood (Note 2). These authors reported that children's accuracy in placing a story's pictures on a background (as in Lesgold et al., 1975) was predictive of their subsequent recall. However, although it is tempting to make something out of data of this kind, one must be mindful of the potential selection artifacts associated with them. It is quite likely, for example, that accurately-repeated sentences (or accurately-placed pictures) were repeated (placed) accurately because they were simpler in terms of propositional content--which in turn might make them easier to comprehend and easier to recall (cf. Johnson, Bransford, Nyberg, & Cleary, 1972)--than those not accurately repeated (placed). Nonetheless, these data represent interesting post hoc discoveries which suggest certain subsequent controlled manipulations.

In sum, we hope to have convinced researchers in this area that--at least according to our belief--the proper baseline condition for studies such as this, in which pictures and other props or strategies are provided, is one in which the subject is allowed

a second rehearsal of the to-be-learned material. Certainly if nothing else comes out of the present study, this would appear to be a valuable recommendation in and of itself. But, given the fascinating possibilities of studying additional aspects of picture and rehearsal phenomena under carefully controlled conditions, we strongly suspect that our "if nothing else" statement will not prove to be the case.

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Footnote

[1]Conversely, a negative effect of irrelevant interpolated activity that might have been anticipated on the basis of Curtis' (Note 5) recent study with adults did not materialize here. Fortunately, this finding casts doubt on another speculation, namely that Lesgold et al. (1975) obtained depressed performance in their activity control condition rather than improved performance in their picture condition.